1/11/17 "Failing to prepare, is preparing to fail."-Anonymous

HW:"Key Features of Functions" HW section

Test 3 on Tuesday 1/17

AIM: What are some key features of functions?

Warm Up:

An internet music service offers a plan whereby users pay a flat monthly fee of $5 and can then download songs for 10 cents each.

(a) What are the independent and dependent variables in this scenario?

Independent: number of downloads

Dependent: Cost/Amount charged.

(b) Fill in the table below for a variety of independent values:

Number of downloads, x	0	5	10	20
Amount Charged, y	\$5	\$5.50	\$6	\$7

$5(.10)=.50$ $10(.10)=1$ $20(.10)=2$

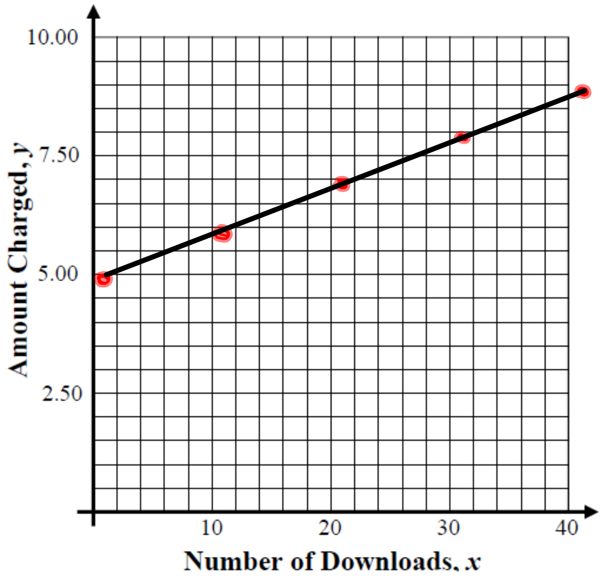
$5+.5=5.50$ $5+1=6$ $5+2=7$

(c) Let the number of downloads be represented by the variable x and the amount charged in dollars be represented by the variable y, write an equation that models y as a function of x.

$y=5+.10(x)$

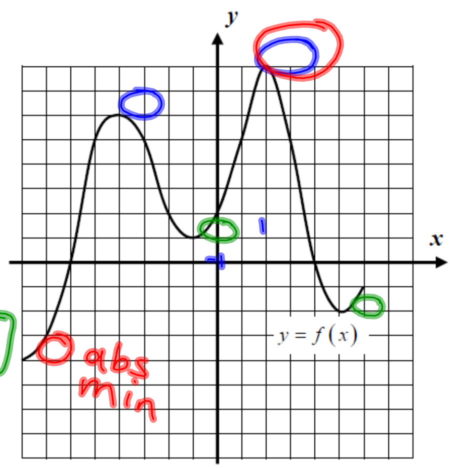
$y=.10(x)+5$

(d) Based on the equation you found in part (c), produce a graph of this function for all values of x on the interval $0 \le x \le 40$. Use a calculator TABLE to generate additional coordinate pairs to the ones you found in part (b).



The graphs of functions have many key features whose terminology we will be using all year. It is important to master this terminology, most of which you learned in Common Core Algebra I.

***Exercise* #1:** The function $y = f(x)$ is shown graphed to the right. Answer the following questions based on this graph.



(a) State the y-intercept of the function. (x-value is always 0)

$\boxed{y=2}$ or $\boxed{(0,2)}$

(b) State the x-intercepts of the function. What is the alternative name that we give the x-intercepts? (y-value is always 0)

x = -6
x = 4 or $\boxed{(-6,0)\ (4,0)}$

$\boxed{\text{zeros, roots, solutions}}$

(c) Over the interval $-1 < x < 2$ is $f(x)$ increasing or decreasing? How can you tell?

Graph goes up as we go left to right.

(d) Give the interval over which $f(x) > 0$. What is a quick way of seeing this visually?

Its above the x-axis

$(-6, 4)$

(e) State all the x-coordinates of the relative maximums and relative minimums. Label each.

relative max = top of hill
relative min = bottom of valle

relative max @ x = -4, 2
relative min @ x = -1, 5

(f) What are the absolute maximum and minimum values of the function? Where do they occur?

y-values

absolute max is the highest
8 occurs @ x = 2
absolute min is the lowest
-4 occurs @ x = -8

(g) State the domain and range of $f(x)$ using interval notation.

Domain: (x) (left→right) $[-8, 6]$

Range: (y) bottom→top $[-4, 8]$

(h) If a second function $g(x)$ is defined by the formula $g(x) = \frac{1}{2} f(x+2)$, then what is the y-intercept of g?

x = 0

$g(0) = \frac{1}{2} f(0+2)$

$g(0) = \frac{1}{2} f(2)$

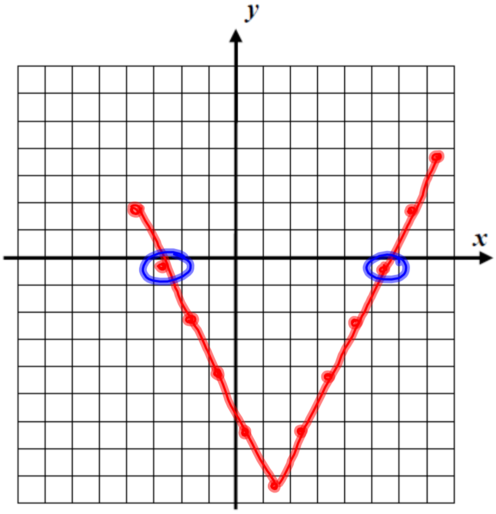
$g(0) = \frac{1}{2} \cdot 8$

$\boxed{g(0) = 4}$

f(2) = 8 from the graph

Exercise #2: Consider the function $g(x)=2|x-1|-8$ defined over the domain $-4 \le x \le 7$.

$y=2|x-1|-8$



(a) Sketch a graph of the function to the right.

x	y
-4	2
-3	0
-2	-2
-1	-4

x	y
0	-6
1	-8
2	-6
3	-4

x	y
4	-2
5	0
6	2
7	4

(b) State the domain interval over which this function is decreasing.

(going down)

$(-4, 1)$ or $[-4, 1]$

(c) State zeroes of the function on this interval.

$x=-3$ $x=5$

(where it hits x-axis)

(d) State the interval over which $g(x) \le 0$

(below the x-axis) $y \le 0$
or = to the x-axis

$[-3, 5]$

(e) Evaluate $g(0)$ by using the algebraic definition of the function. What point ~~does this correspond~~ to on the graph?

use the equation.

$g(0)=2|0-1|-8$

$=2|-1|-8$

$=2(1)-8$

$\boxed{g(0)=-6}$

(f) Are there any relative maximums or minimums on the graph? If so, which and what are their coordinates?

relative minimum @ $(1, -8)$

You need to be able to think about functions in all of their forms, including equations, graphs, and tables. Tables can be quick to use, but sometimes hard to understand.

Exercise #3: A **continuous** function $f(x)$ has a domain of $-6 \le x \le 13$ with selected values shown below. The function has exactly two zeroes and has exactly two turning points, one at $(3,-4)$ and one at $(9,3)$.

crosses x-axis twice

Max or Min

x	-6	-1	0	3	5	8	9	13
$f(x)$	5	0	-2	-4	-1	0	3	1

Increasing

(a) State the interval over which $f(x)<0$.

$(-1, 8)$

(b) State the interval over which $f(x)$ is increasing.

when do the y-values start to get bigger?

$\{x \mid 3<x<9\}$